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No. 767,216.

T. A. EDISON.

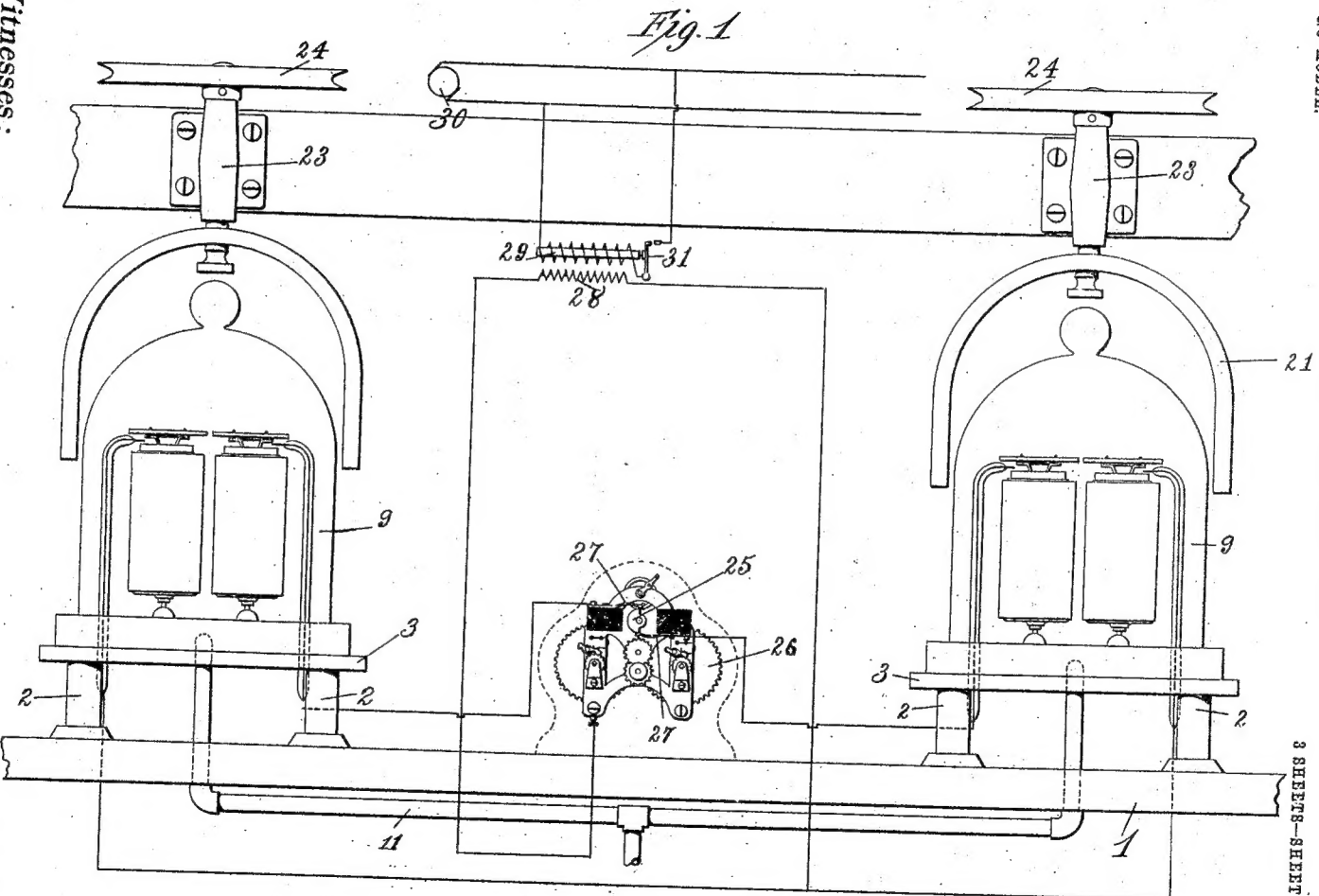
PATENTED AUG. 9, 1904.

APPARATUS FOR VACUOUSLY DEPOSITING METALS.

NO MODEL.

APPLICATION FILED AUG. 1, 1903.

3 SHEETS—SHEET 1.



Witnesses:

*Swearing 71, 1007*

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Attorney

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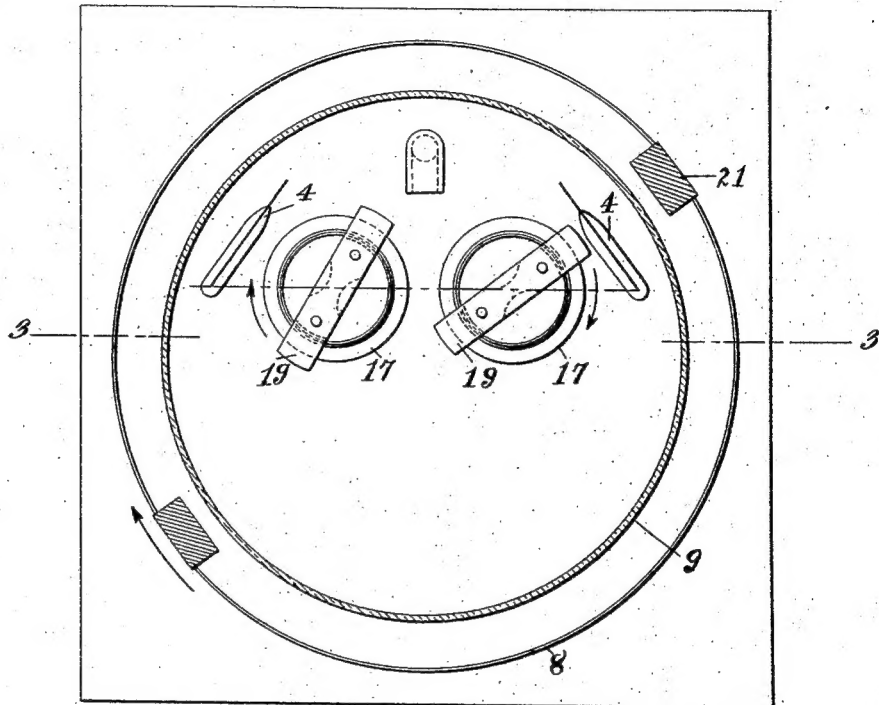
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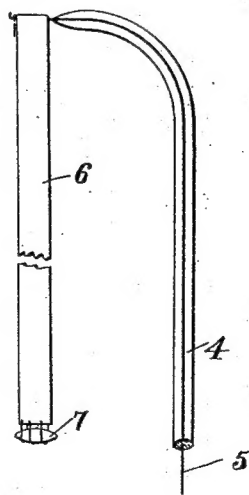
NO MODEL.

3 SHEETS—SHEET 2.

*Fig. 2*



*Fig. 4*



Witnesses:

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*William A. Deane*

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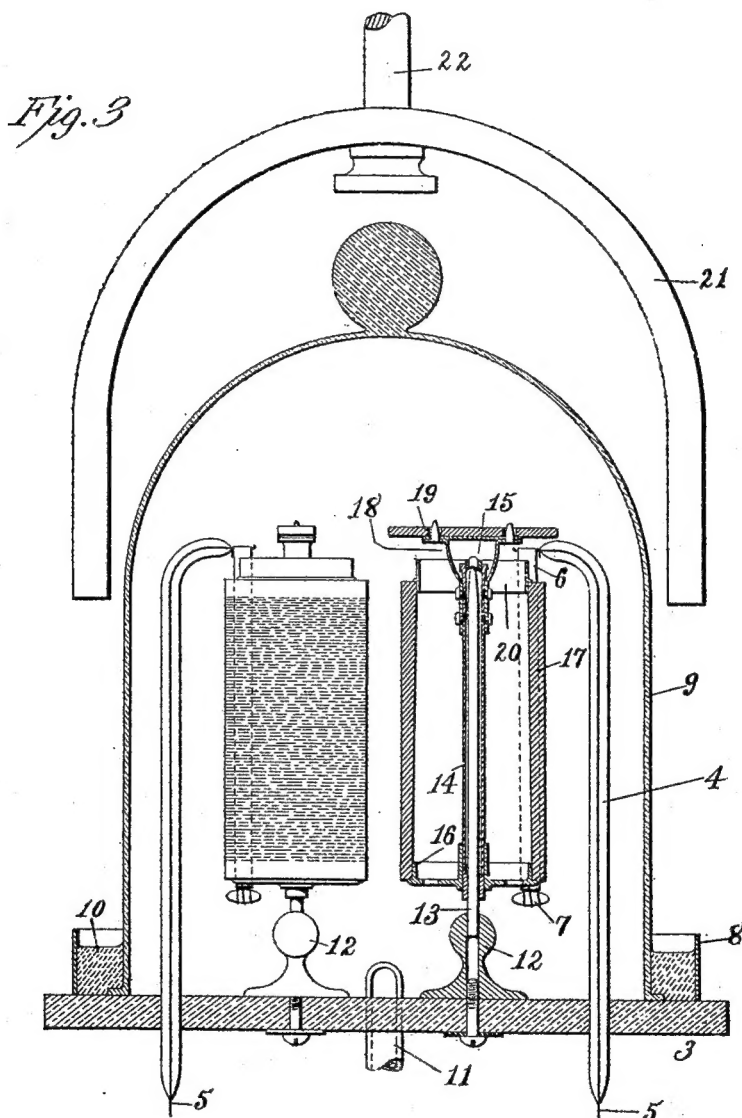
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APPARATUS FOR VACUOUSLY DEPOSITING METALS.

APPLICATION FILED AUG. 1, 1903.

NO MODEL.

3 SHEETS—SHEET 3.



Witnesses:

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## UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO  
NEW JERSEY PATENT COMPANY, OF ORANGE, NEW JERSEY, A COR-  
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## APPARATUS FOR VACUOUSLY DEPOSITING METALS.

SPECIFICATION forming part of Letters Patent No. 767,216, dated August 9, 1904.

Application filed August 1, 1903. Serial No. 167,930. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, Orange, in the county of Essex, State of New Jersey, have invented certain Improvements in Apparatus for Vacu-  
5 ously Depositing Metals, of which the following is a description.

My invention relates to an improved appa-  
ratus for more expeditiously carrying into ef-  
fect the process for depositing metals *in vacuo*  
10 of the general character covered by my Pat-  
ents No. 526,147, of September 18, 1894, and  
No. 713,863, of November 18, 1902.

The apparatus has been designed particu-  
larly for depositing on phonograph-records a  
15 minutely thin film of vaporized metal which  
shall act as a foundation for the heavier elec-  
troplated deposit in order that a matrix or  
mold of such a record may be secured.

20 With my improved apparatus I utilize a plu-  
rality of phonograph-records or other objects  
to be coated in the same vacuum-chamber and  
simultaneously deposit the metal on such ob-  
jects by maintaining a high-tension discharge  
25 between electrodes formed of the metal to be  
deposited. This materially facilitates the  
process, since considerable time is occupied in  
mounting and sealing the vacuum-chamber  
and in exhausting the same.

30 I find in the practical operation of my pro-  
cess that if the electrical discharge is main-  
tained continuously between the metallic elec-  
trodes, and particularly if the latter are very  
thin, as is preferable, the electrodes become  
35 objectionably heated and may in time actually  
melt, so as to destroy their utility. This ob-  
jection could of course be overcome by pe-  
riodically interrupting the current, so as to  
permit the electrodes to cool; but, as it is  
40 preferable that the induction-coil and other  
electrical apparatus, as well as the mechanical  
and magnetic appliances, should operate con-  
tinuously, I secure the desired result by em-  
ploying a pair of exhausted chambers in which  
45 the depositing takes place alternately, so that  
during the time that metal is being deposited  
on the object or objects in one chamber the

electrodes of the other chamber are permitted  
to cool.

The present invention not only relates to the  
50 details of construction and arrangement al-  
ready indicated, but it relates also to further  
constructional details, all as will be more fully  
hereinafter described and claimed.

In order that the invention may be better  
55 understood, attention is directed to the accom-  
panying drawings, forming a part of this speci-  
fication, in which—

Figure 1 is a front view of the apparatus for  
use in coating four phonograph-records and  
60 showing the circuits diagrammatically; Fig.  
2, a cross-sectional view through one of the  
vacuum-chambers; Fig. 3, a vertical sectional  
view on the line 3 3 of Fig. 2, and Fig. 4 a  
separate detailed view of one of the electrodes  
65 and its support.

In all of the above views corresponding parts  
are represented by the same numerals of ref-  
erence.

The base 1 is provided with supports 2, on  
70 which are mounted the base-plates 3, made,  
preferably, of glass. Extending up through  
the base-plates 3 are glass tubes 4, carrying  
circuit-wires 5 5. Depending from the ends  
of these conductors are electrodes 6, made of  
75 the metal which is to be deposited and pre-  
ferably in the form of thin strips of foil. For  
the coating of phonograph-records I prefer-  
ably use gold, owing to the fact that it may be  
highly comminuted and also because of its non-  
80 oxidizable character. I find that the best re-  
sults are secured and the most even coating  
obtained when the electrodes are perfectly  
flat, and I therefore preferably attach a small  
weight 7 to the bottom of each to effect this  
85 result.

Mounted on the plate 3 is a metal rim 8,  
within which is placed a glass bell or jar 9,  
having a flanged lower end resting on said  
plate. A layer of paraffin 10 or similar wax-  
90 like sealing material in molten condition is  
now flowed into the space within the rim 8,  
so as to make a perfectly-tight joint. Air  
from within the glass jar or bell 9 is exhausted

therefrom through a pipe 11, connected with a vacuum-pump of any suitable and approved type. Within the vacuum-chamber are one or more supports 12, which carry vertical shafts 13, having tapered upper ends. Surrounding each of these shafts is a sleeve 14, provided with a hardened bearing-cup 15 at its top, which engages the shaft 13. The lower end of the sleeve 14 carries a disk 16, which receives the record or other object 17. Extending up from the sleeve 14 are arms 18, which receive a removable armature 19.

The phonograph-record or other object preferably carries at its top a guard or shield 20, which fits within the top of the record 17 and is supported thereby. This guard may be of any material, brass being preferably used by me. The guard receives the metal which would ordinarily be deposited within the interior of the record 17, and when made of brass it appears to deflect the electrical discharge in a downward direction against or toward the outer surface of the record. The guard thus prevents the metal from depositing on the inside of the object and causes the metal to deposit evenly on its edge with a clear line of demarcation, so as to permit a uniform electroplating, as will be understood.

Mounted outside of each of the vacuum-chambers is a magnet 21, removably carried at the lower end of the shaft 22, mounted in the bearing 23 and rotated by a belt-wheel 24, to which power is applied. In order to operate the vacuum-chambers alternately to permit the electrodes within one to cool while the depositing is taking place in the other, I make use of a switch 25, preferably driven by a clockwork mechanism 26 and making contact alternately with contact-springs 27. These springs are connected each with one of the electrodes of the two chambers, as shown. The other electrodes (one in each chamber) are connected to one side of the secondary circuit 28 of an ordinary induction-coil. The other side of this secondary circuit connects with the switch 25 through the clockwork mechanism, as shown. The primary circuit 29 of the induction-coil is connected in multiple with the source of supply 30 and includes a circuit-breaker 31, as is common in this art. In operation a proper vacuum is created in the two chambers, and by means of the switch 25 the induction-coil will be connected alternately, first with the electrodes of one chamber and then with the electrodes of the other chamber. The discharge is so regulated as to secure between the electrodes a silent or brush discharge, as I describe in my patent last referred to. This discharge causes the metal composing the electrodes to be vaporized and deposited on the objects. The magnets 21 are simultaneously rotated, so as to rotate the objects, whereby a perfectly-uniform film will be deposited thereon. When this film is of the desired thickness, the bells

or jars 9 are removed, thereby permitting the coated objects to be removed for subsequent treatment, whereupon the operations described are repeated.

Having now described my invention, what I claim as new therein, and desire to secure by Letters Patent, is as follows:

1. In vacuum deposit apparatus, the combination with an exhausted chamber with metallic electrodes therein and means for effecting an electrical discharge between said electrodes, of supports within the chamber and between the electrodes for sustaining a plurality of objects to be coated, and means for simultaneously rotating said objects, substantially as set forth.

2. In vacuum deposit apparatus, a weighted metallic foil-like electrode, substantially as and for the purposes set forth.

3. In vacuum deposit apparatus, an electrode-foil supported at its upper end and a weight carried by said foil at its lower end, substantially as set forth.

4. In vacuum deposit apparatus, a shield or guard carried by the upper edge of the object to be coated, substantially as and for the purposes set forth.

5. In vacuum deposit apparatus, the combination with an exhausted chamber and electrodes therein, of a vertical shaft within said chamber, a sleeve rotatably mounted on said shaft, and a disk carried by said sleeve for supporting the object to be coated, substantially as set forth.

6. In vacuum deposit apparatus, the combination with an exhausted chamber and electrodes therein, of a vertical shaft within said chamber, a sleeve rotatably mounted on said shaft, a disk carried by said sleeve for supporting the object to be coated, a removable armature carried by said sleeve, and a magnet mounted externally of the chamber for attracting and rotating said armature, substantially as set forth.

7. In vacuum deposit apparatus, the combination with a pair of exhausted chambers, electrodes therein and supports for objects to be coated in said chambers, of a source of high-tension current, and means for alternately connecting said source with the electrodes of the respective chambers, substantially as and for the purposes set forth.

8. In vacuum deposit apparatus, the combination with a pair of exhausted chambers, electrodes therein and supports for objects to be coated in said chambers, of a source of high-tension current, and means for automatically and alternately connecting said source with the electrodes of the respective chambers, substantially as and for the purposes set forth.

9. In vacuum deposit apparatus, in combination, a plurality of supports for objects to be coated and of pairs of electrodes supported *in vacuo*, a source of high-tension current and

means for automatically and alternately connecting said source with each pair of electrodes, substantially as set forth.

10. In vacuous deposit apparatus, in combination, a plurality of supports for objects to be coated, a plurality of electrodes supported *in vacuo*, a source of high-tension current and means for automatically and regularly

connecting said source with said electrodes in pairs.

This specification signed and witnessed this 30th day of July, 1903.

THOS. A. EDISON.

Witnesses:

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